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PATENT

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SYSTEM AND METHOD FOR PROVIDING PERSONAL AND EMERGENCY SERVICE HAILING IN WIRELESS NETWORK

Background of the Invention

1. Field of the Invention

This invention generally relates to a system and method for locating and contacting persons and facilities in a wireless network and specifically relates to identifying and contacting persons and facilities nearest to a requestor's location by use of a central location-tracking database.

2. Description of Related Art

Rapid advances are being made in the area of wireless communications. An increasing number of applications are being developed for wireless communication device platforms, ranging from smart cellular phones and wireless communicators, to two-way text pagers. Many of these products interface with location-tracking devices, such as Global Positioning System

("GPS") receivers, that deliver real-time location based information and services to users of wireless communication devices ("WCDs"). The location-tracking capabilities of these devices give rise to the opportunity to solve two problems inherent in today's WCDs.

First, the current state of the art requires that WCDs be contacted using a unique identifier or number. If, for instance, two adjacent users of WCDs wish to contact each other, one user must know the unique identifier or number of the other user, or vice versa. Without the unique wireless communication device ("WCD") identifier or number, a voice or data communication cannot be initiated although the two users can identify each other's position relative to their own positions. For example, if two cellular phone users separated by a distance of 50 meters wished to initiate communication via their cellular phones, but neither knew the other's unique identifier or number, one would have to shout or otherwise indicate their unique identifier to the other.

Similarly, two adjacent WCD users may not have compatible WCDs, so a direct link cannot be established. For instance, a cellular phone user currently may not be able to directly contact a user of a unidirectional or bi-directional

pager ("pager") or personal digital assistant ("PDA") with a wireless area network interface.

Secondly, a key feature of today's WCDs is the safety they provide by enabling the user of such a device to contact emergency services when required. The current technology only has the capability to identify emergency services and facilities that are located within a fairly large area. Currently, cellular phone networks achieve the routing of emergency calls by identifying the particular mobile switching center immediately available to the cellular user. Thus, each mobile switching center is identified with a corresponding emergency facility.

The inherent disadvantage to this system is that the area covered by a particular mobile switching center can be quite large, encompassing tens of miles of roadway. While the current technology would enable a WCD user to contact an emergency facility located within that mobile switching center coverage area, it would necessarily ignore an ambulance or police cruiser sitting 50 meters adjacent to the WCD user. Furthermore, the current technology will only provide access to the particular emergency facility dedicated to a particular mobile switching center while there may be another appropriate emergency facility within a short distance of the WCD user.

Therefore a need exists to overcome the problems with the prior art as discussed above, and particularly for a system and method for personal and emergency service hailing in a wireless network.

Summary of the Invention

The present invention, according to a preferred embodiment, overcomes problems with the prior art by providing a central location tracking system for wireless communication device ("WCD") users. A WCD user will be able to identify other WCD users in their area and initiate communication with another user by identifying the approximate position of the other WCD user relative to their current position. For example, a WCD user, using the present invention, will be able to identify those users around him and, for example, contact the WCD user who is 30 meters to the north or the WCD user 30 meters to the southwest. Therefore, WCD users can initiate communication with one another without knowing the unique identifier or number of the other WCD.

Similarly, according to a preferred embodiment of the present invention, a communication system provides WCD users with the flexibility to initiate

communications with devices that may be normally incompatible with one another. A communication system, according to the present invention, identifies a preferred device of users in proximity to a user initiating a communication request. The device type or types may be presented to the user initiating the communication request. Should the user initiating the communication request desire to communicate with another user of an incompatible device, the present invention will handle any protocol conversion and route the message via an appropriate method to the user of the incompatible device. Thus, the present invention allows users to communicate with one another even though they may have normally incompatible devices.

A preferred embodiment of a communication system, according to the present invention, provides significant advantages to users of the communication system when having to hail emergency services. Because the present invention always knows the location of the user, and likewise where emergency services are located, a preferred embodiment of the present invention allows a much quicker and more appropriate response to requests for emergency services.

A preferred embodiment of the present invention will determine the very closest emergency resources without the dependence on mobile switching

centers. In fact, a preferred embodiment of the present invention will locate emergency services not identified with a mobile switching center, providing for the quickest possible response time. In addition, the present invention, according to a preferred embodiment can provide methods for contacting other WCD users in the immediate vicinity for the purposes of providing alternate forms of emergency response. The present invention can also send messages back to the user initiating the request for emergency services to indicate what type of assistance is en route, and allow the user initiating the request to contact emergency services.

Brief Description of the Drawings

FIG. 1 is a block diagram illustrating a personal and emergency service hailing system in accordance with a preferred embodiment of the present invention.

FIG. 2 is a more detailed block diagram showing a communication management server consisting of a communication request handler for providing

personal hailing in the system of FIG. 1, according to a preferred embodiment of the present invention.

FIG. 3 is a more detailed block diagram showing a communication management server consisting of an alert handler for providing emergency service hailing in the system of FIG. 1, according to a preferred embodiment of the present invention.

FIG. 4 is a more detailed block diagram showing a WCD in the system of FIG. 1, according to a preferred embodiment of the present invention.

FIGs. 5, 6, and 7 are three operational flow diagrams illustrating three exemplary operational sequences for the system of FIG. 1, according to preferred embodiments of the present invention.

Description Of The Preferred Embodiments

According to a preferred embodiment of the present invention, as shown in FIG. 1, a personal and emergency services hailing system for a wireless

network includes a group **110** of at least one WCD, comprised of individual WCD **106**, communicating over a wireless network **108** to a wireless network gateway **104**. The wireless network gateway **104** connects to another communication network **102**, such as but not limited to the Internet, which is communicatively coupled to a communication management server **100**. The communication management server **100** also connects to at least one emergency facility **114**. This communication connection **112** between the communication management server **100** and the at least one emergency facility **114** may be any communication connection, including but not limited to a standard telephone line connection, an Internet connection, an optical connection, or a wireless connection.

FIG. 2 is a block diagram of an exemplary communication management server **100** performing personal hailing services according to the preferred embodiment of the present invention depicted in FIG. 1. Communications with the network **102** of FIG. 1 are processed by the communication request handler **200** via a communication interface **208**. The communication request handler **200** maintains bi-directional communication with a location database **202** and a profile database **206**. The location database **202** is stored in memory for storing current location tracking information sent from individual WCDs **106** of FIG. 1,

and a list of currently adjacent WCDs. The profile database **206** is stored in memory for storing a WCD preferences, such as information about the user, preferred communication devices and protocols, and the furthest distance away to look for other WCDs or emergency services, which may also be referred to as proximity preferences.

Both the location database **202** and the profile database maintain communications with a proximity service handler **204**. The proximity service handler **204** will accept WCD locations from the location database **202**, compute the distance between the WCD requesting hailing services and the WCDs in the location database **202**, compare the distance with proximity preferences stored in the profile database **206**, and communicate identification and location information of WCDs whose location meets the preferences stored in the profile database **206** to the communication request handler **200**. The proximity service handler **204** also calculates lists of currently adjacent WCDs and stores these lists in the location database **202** for efficient determination of those WCDs in proximity to a requesting WCD.

FIG. 3 provides a block diagram of the communication management server **100** performing emergency services hailing in a preferred embodiment of

the present invention as depicted in FIG. 1. To perform emergency services hailing, the location database **202**, the proximity service handler **204**, and the profile database **206** of FIG. 2 maintain communications with an alert handler **300**. The alert handler maintains a bi-directional communication interface **302** with the network **102** shown in FIG. 1, and a unidirectional or bi-directional communication interface **304** with the emergency facility **114** of FIG. 1 via a communication connection **112** as depicted in FIG. 1.

Note that emergency services, as used herein, may include many different forms of emergency resources that could respond to an emergency condition. For example, emergency services comprises at least one from the following list: an emergency facility, an emergency mobile unit, an emergency service person, an officer with wireless communication device, and an individual with wireless communication device. Other types of emergency services that are reachable according to the present invention should be obvious to those of ordinary skill in the art in view of the present discussion.

Depicted in FIG. 4 is a block diagram of a WCD **106** of FIG. 1 according to a preferred embodiment of the present invention. The WCD **106** has a wireless area network interface **400** and a transmission device **410** for

communicating with the wireless area network or FIG. 1. In a preferred embodiment of the present invention, the transmission device **410** may comprise an antenna, an optical transmitter/receiver, or any other communication device suitable for use with a wireless area network. The wireless area network interface **400** processes the communications between the wireless area network **108** of FIG. 1 and the communication manager **402**. The communication manager **402** receives location information from a location determining system **404**. The location determining system **404** may utilize a GPS receiver or any other means of determining absolute position, as should become obvious to those of ordinary skill in the art in view of the present discussion. The communication manager **402** also maintains communications with the user output device **406**, which may comprise a display of any type, an audible signal generator, or both. The communication manager **402** also accepts inputs from a user input device **408**, which can be any method of input including but not limited to push buttons, keypads, joysticks, microphones, and other sensors. In some implementations, the WCD may combine the user output device **406** and the user input device **408**, such as touch screen devices.

FIG. 5 depicts an exemplary operational flow diagram describing a personal hailing operational sequence of the WCD according to a preferred

embodiment of the present invention. The WCD may be running other processes contemporaneously with its operations according to the present invention. Upon entering the operational sequence, at step **500**, the WCD will send, at step **502**, its location information, sometimes referred to as coordinates, to the communication management server **100**. Next, the WCD determines, at step **504**, whether the user has indicated that they would like to contact another user of a WCD. If the user has not so indicated, the operational sequence is terminated, at step **514.** The sequence may be immediately resumed, or may wait for a certain event before resuming.

If the user has indicated that they wish to contact another user of a WCD, the WCD requests, at step **504**, the names and identifiers of nearby WCD from the communication management server **100**. The WCD typically sends at least one wireless message proximity request to the communication management server **100** to initiate such a request. The WCD then receives at least one response message from the communication management server **100**. Preferably, the at least one response message comprises a wireless message proximity response that identifies the requested information. After receiving, at step **508**, a response message comprising the names and identifiers of nearby WCDs (that satisfy a proximity requirement associated with the requesting WCD)

from the communication management server **100**, the WCD prompts, at step **510**, the user to select a nearby WCD to contact. For example, this prompting can be done by displaying choices on a display (not shown) or by another user output device **406**. Once a WCD is selected by the user, at step **512**, communication with the chosen WCD is initiated and the sequence terminates, at step **514**. The sequence may be immediately resumed, or may wait for a certain event before resuming.

FIG. 6 illustrates an exemplary operational sequence for the communication management server **100** in accordance with a preferred embodiment of the present invention. Once the communication management server **100** receives, at step **602**, a communication from a WCD, the server determines, at step **604**, whether it is a location update request. If the communication is a location update request, then the communication management server **100** stores, at step **606**, the location of the WCD in the location-tracking database, and then exits the operational sequence, at step **612**.

However, if the communication is not a location update request but is a request for personal hailing services, the communication management server retrieves, at step **608**, the information of nearby WCDs (that satisfy a proximity

requirement associated with the requesting WCD), such as names, numbers, identifiers, aliases, preferred devices, or any combination thereof. This information is then sent, at step **610**, in at least one response message to the WCD requesting personal hailing services, and then the communication management server **100** exits the operational sequence, at step **612**. Preferably, the at least one response message comprises a wireless message proximity response that identifies the requested information.

FIG. 7 is an exemplary operational flow diagram of an emergency services hailing operational sequence of the communication management server **100** according to a preferred embodiment of the present invention. The operational sequence is initiated, at step **700**. Upon receiving, at step **702**, a communication request from a WCD, the communication management server **100** determines, at step **704**, whether the communication is a request for emergency services. If the communication request is not a request for emergency services, the alert hailing operational sequence is terminated, at step **712**. The operational sequence can be re-entered, at step **700**, immediately or at any time.

If the communication request is determined, at step **704**, to be a request for emergency services, the communication request handler retrieves, at step

708, the information, which may include names, numbers, identifiers, aliases, preferred devices, or any combination thereof, of the nearest emergency services and nearby WCDs (that satisfy a proximity requirement associated with the requesting WCD). The communication management server **100** will then automatically contact (e.g., by sending a signal and/or a message thereto), at step **708**, the emergency services and nearby WCDs that satisify the proximity requirement associated with the requesting WCD. The communication management server **100** will also preferably send, at step **710**, emergency service and nearby WCD information to the WCD requesting the emergency services. This information can be provided to the user of the requesting WCD, such as via a display (not shown). At this point the emergency service hailing operational sequence terminates, at step **712**. However, the WCD requesting the emergency service hailing may choose to contact the emergency services or the nearby WCD, such as by utilizing the information received by the requesting WCD, and preferably provided to the user, to initiate communication, at step **710**, and/or by using the personal hailing operational sequence as depicted in FIG. 6. The emergency service hailing operational sequence may be re-entered, at step **700**, immediately or at any time.

The present invention can be realized in hardware, software, or a combination of hardware and software. A communication management server **100** such as shown in FIG. 1, 2, and 3, according to the preferred embodiments of the present invention, can be realized in a centralized fashion in one computer system, or in a distributed fashion where different elements are spread across several interconnected computer systems. Any kind of computer system - or other apparatus adapted for carrying out the methods described herein - is suited. A typical combination of hardware and software could be a general purpose computer system with a computer program that, when being loaded and executed, controls the computer system such that it carries out the methods described herein.

Similarly, the operation sequence of the WCD depicted in FIG. 1 and 4 can be realized in hardware, software, or any combination thereof. Any kind of computer system - or other apparatus adapted for carrying out the methods described herein - is suited. A typical combination of hardware and software, for example, could be a cellular phone with a computer program that, when being loaded and executed, controls the cellular phone such that it carries out the methods described herein.

The present invention can also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which - when loaded in a computer system or a wireless device - is able to carry out these methods. Computer program means or computer program in the present context can be any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following a) conversion to another language, code or, notation; and b) reproduction in a different material form.

Each computer system may include, inter alia, one or more computers and at least a computer readable medium allowing a computer to read data, instructions, messages or message packets, and other computer readable information from the computer readable medium. The computer readable medium may include non-volatile memory, such as ROM, Flash memory, Disk drive memory, CD-ROM, and other permanent storage. Additionally, a computer medium may include, for example, volatile storage such as RAM, buffers, cache memory, and network circuits. Furthermore, the computer readable medium may comprise computer readable information in a transitory state medium such as a network link and/or a network interface, including a wired network or a